



21st Century Skills Map

GEOGRAPHY

DESIGNED IN COOPERATION WITH THE NATIONAL COUNCIL FOR GEOGRAPHIC EDUCATION (NCGE)

This 21st Century Skills Map is the result of hundreds of hours of research, development and feedback from educators and business leaders across the nation. The Partnership has issued this map for the core subject of Geography. This tool is available at www.21stcenturyskills.org.

The Partnership advocates for the integration of 21st Century Skills into K-12 education so that students can advance their learning in core academic subjects.

The Partnership has forged alliances with key national organizations that represent the core academic subjects, including Social Studies, English, Math, Science and Geography. As a result of these collaborations, the Partnership has developed this map to illustrate the intersection between 21st Century Skills and Geography. The maps will enable educators, administrators and policymakers to gain concrete examples of how 21st Century Skills can be integrated into core subjects.

- A 21st Century Skills**
- B Skill Definition**

INFORMATION, MEDIA & TECHNOLOGY LITERACY

GEOGRAPHY

Media Literacy

- Understanding how media messages are constructed, for what purposes and uses tools, characteristics and conventions.
- Examining how individuals interpret messages differently, how values and points of view are included or excluded and how media can influence beliefs and behaviors.
- Possessing a fundamental understanding of the ethical/legal issues surrounding the access and use of information.

4th Grade	8th Grade	12th Grade
<p>OUTCOME: Understands how media messages are constructed for what purposes and uses tools, characteristics and conventions.</p> <p>EXAMPLE: Students use digital weather maps to explain that severe and changing daily and weekly weather patterns are important in making sound civic decisions about individual and group activities, such as sports, recreation, travel (e.g. tornado watch, severe weather, frost advisories, travel delays, driving conditions, heat indexes, and wind advisories).</p> <p>EXAMPLE: Students discuss the ways people respond to weather warnings.</p> <p>EXAMPLE: Students use computer software and web pages to create an announcement that promotes the recycling of plastics and other materials in the local community, and the beneficial consequences for the local and global environment.</p> <p>TECHNOLOGY USE: The Internet to review and analyze the civic importance of weather information; Computer software.</p>	<p>OUTCOME: Examines how individuals interpret messages differently and how values and points of view are included or excluded.</p> <p>EXAMPLE: Students read and analyze the positions on environmental issues taken by organizations and posted on the web (green groups, conservative environmental groups, property rights groups) to determine the issues on which there are major differences, where there may be some agreement, and where the issues addressed are based on different values relative to the natural environment.</p> <p>EXAMPLE: Students develop a plan for implementing an environmentally-focused project in the local community such as protecting a local wetland or developing an urban greenway along a stream that uses digital mapping, data collection, land use analysis, economic development, population change, and other relevant variables.</p> <p>TECHNOLOGY USE: World Wide Web.</p> <p>SPEAKER OPPORTUNITY: Invite individuals representing environmental and non-environmental perspectives on the future of the local community to speak to the class.</p>	<p>OUTCOME: Understands how media messages are constructed for what purposes, and uses tools, characteristics and conventions.</p> <p>EXAMPLE: Students make an inventory of the way that geography content (landscapes, globes, maps, land uses, cultural depictions, etc.) are used as company logos, web sites, backdrops, screen savers, panoramas, etc. in the digital and print media and categorize them by media and content. Assess the appropriateness of the geography content used as a backdrop relative to the expectations (criteria) that people use for getting a person's attention.</p> <p>EXAMPLE: Students develop criteria and compare their preferences for logos and backdrops in advertisements with those of others in their class to discover patterns about the uses of geography to set tone and emotional context in advertising. (i.e., auto commercials often use safe facts, energy commercials often show drilling rigs, bottled water often uses mountain settings, etc.).</p> <p>TECHNOLOGY USE: World Wide Web and computer software. Digital and print advertising.</p>

- C Interdisciplinary Theme**
- D Sample Student Outcome/Examples**

An example from the Geography 21st Century Skills Map illustrates sample outcomes for teaching Media Literacy.



PARTNERSHIP FOR
21ST CENTURY SKILLS



Geography and 21st Century Skills

Based on key geographic concepts and principles and incorporating best classroom practices, this document suggests ways to enhance classroom geography and skills relative to the demands of the 21st century. It represents a starting point for ideas and discussions with an eye to the future.

This map provides opportunities to engage students and teachers in geographic inquiry that align with contemporary methods and concepts for studying Earth in terms of its natural and human characteristics.

Geography integrates the study of the natural and human elements of Earth to reveal their complex relationships. Such concepts and skills are incorporated in Geography for Life: The National Geography Content Standards (1994), with an updated 2nd edition to be released in 2010. The study of the spatial relationships among the components of the human and physical systems is enhanced by using the latest and most reliable geographic information available through technology. The opportunities by students and geographers to observe, synthesize, and present data from satellites, ground stations, and local observations represent collaborative processes within geography that are adding value to a wide range of interdisciplinary studies in the 21st century.

Geography's major contributions for 21st century skills development can be viewed through three lenses: 1) Scholarship; 2) Stewardship; and 3) Citizenship. Scholarship reflects geography's continued quest for knowledge about Earth and its systems using the most appropriate technologies. Digital information and virtual representations of Earth and its systems are commonly applied in geographic scholarship. Stewardship reflects the concerns for the positive relationship between people and the environment through sustainable interactions. Responding to challenges of global changes in climate, population changes, natural resources availability, and land use are within the realm of stewardship. Citizenship reflects equipping every person with the necessary 21st century skills and access to information that will enable them to become responsible and effective in their active roles as citizens.

Geography for Life: National Geography Standards 1994 (1994). Washington, DC: National Geographic Society (available through the store at www.ncge.org).

It should be noted that most of the examples in this map are well-suited for cross-disciplinary approaches. For example, the ideas contained in this map can and should integrate student use of other core subjects including science, mathematics, language arts, history, art and world languages.





Information Literacy

GEOGRAPHY



4th Grade

- *Accessing information efficiently and effectively, evaluating information critically and competently and using information accurately and creatively for the issue or problem at hand*
- *Possessing a fundamental understanding of the ethical/legal issues surrounding the access and use of information*

OUTCOME: Accesses information efficiently and effectively, evaluates information critically and competently



EXAMPLE: Using a variety of sources (such as www.worldmapper.org, and www.nationmaster.com), and working in small teams, students access information about places around the world and create a poster display, slideshow, or other multimedia presentation of 3 selected variables (such as high tech exports, birth rate, percentage of youth in school) and how those 3 selected variables compare between countries, and why.

EXAMPLE: Students provide accurate citations and references to the information they use from electronic and print sources to judge authenticity. They reflect how errors and gaps can exist in the information that is gathered by the UN, national statistics agencies, and by other sources, and how those errors can be recognized and managed.

TECHNOLOGY USE: Web-based access to print information, graphics, maps, and photographs.



OUTCOME: Accesses information efficiently and effectively, evaluates information critically and competently

EXAMPLE: Students choose 3 countries from the book *Hungry Planet*, collect food labels from their homes, analyze advertisements for



8th Grade

OUTCOME: Evaluates information critically and competently and uses information accurately and creatively for the issue or problem at hand



EXAMPLE: Compare and contrast shapes of different countries (e.g., Italy and Chile as elongated, Japan and Indonesia as a string of islands, and Egypt and Spain as roughly square); students explain how the shape may affect political cohesiveness or a sense of civic attachment to the larger political unit; discuss providing government services within compact countries compared to countries that have territories scattered. Students analyze the effects that country shape may have on the time and costs necessary to develop civic linkages in a country with scattered territories.

EXAMPLE: Students discuss the impact that changes in communications, such as the Internet, World Wide Web, cellular phones, etc., have on the flow of civic information in countries, such as community issues and governmental response; forming responses to community emergencies.

SUPPORTING STRUCTURE: Web maps to show countries with different shapes; classify countries on the map as compact or scattered.

SUPPORTING STRUCTURE: Map the distances and time necessary to support civic activities, NGOs, and citizen groups from the national governmental center.



12th Grade

OUTCOME: Uses information accurately and creatively for the issue or problem at hand

EXAMPLE: Students use images from the web to compare and contrast classical and contemporary art by Dutch, French, U.S., Chinese, Korean, Zimbabwean, and other artists that portray geographic landscapes. Students analyze Earth's landscapes (climatic events, volcanism, vegetation, people using the land, resource extraction) in art as evidence of environmental change on a dynamic Earth.

EXAMPLE: Students compare and contrast natural and cultural scenes using repeat photography as an art form that presents evidence of geographic and environmental change.

FIELD TRIP OPPORTUNITY: Local art museum, or see fine arts digital images available on the web, including those from many countries and cultures.

OUTCOME: Possesses a fundamental understanding of the ethical/legal issues surrounding the access and use of information



EXAMPLE: Students use widely available public digital imagery from the web to analyze the information that can be observed on the images, such as residences, swimming pools, banks, parking lots, and parks. The students then discuss the ways that different people could use the information, such as land speculators,





Creativity and Innovation (continued)

GEOGRAPHY



4th Grade

food, and use the web to classify information relative to the categories on the food pyramid; use digital map sources from the web to map locations where their food is grown; and discuss how climate and culture play roles in food production. They assess how natural events (hurricanes, floods) and human actions (wars, land use) affect food production and distribution.

EXAMPLE: Students compare foods grown locally with foods grown in their 3 selected countries to analyze the spatial pattern of food production and distribution.

EXAMPLE: Students analyze the spatial patterns of food production and transportation to judge the impact that agriculture has on the natural environment.

FIELD TRIP OPPORTUNITY: Local farm or garden; local farmers market; digital maps on the web to plot the spatial patterns of food production and consumption.

OUTCOME: Uses information accurately and creatively for the issue or problem at hand

EXAMPLE: Students gather original data, such as observations of local weather (temperature and precipitation) and climate (comparing daily with long term trends), and create digital graphs or charts to display the information.

EXAMPLE: Using the web and archival sources students research historical weather patterns (temperature and precipitation) in the area and



8th Grade

OUTCOME: Uses information accurately and creatively for the issue or problem at hand

EXAMPLE: After identifying a local issue (i.e., recycling opportunities, congested traffic, excessive litter in a park, noise pollution, water contamination, recreation facilities), students conduct primary research, gather numerical data, convert it to statistical information (means, trends, correlations), present it in graphs, charts, and maps, use software to develop community digital data bases, and present a position on the issue by preparing an editorial slideshow presentation for a local governing board, or develop a website to use in presenting their position, and make a multimedia presentation for local service clubs, such as Kiwanis, Rotary, Library Guild, etc.

EXAMPLE: Exercise civic responsibility by taking a position on a local issue and support its resolution through participating in discussions, making presentations, being interviewed by media, and writing narratives to be published.

FIELD STUDY OPPORTUNITY OR INDIVIDUAL STUDENT PROJECT: Local community issues may be observed and recorded using digital cameras, surveys, and field measurements for analysis and presentation.



12th Grade

burglars, or urban planners, and judge the ethical and legal issues that may accompany the use of geographic information.

EXAMPLE: Students evaluate the pros and cons of the following arguments: (1) Should countries have the right to prohibit satellite images as satellites orbit across their territory? (2) Should countries have the right to blur the satellite images in areas deemed sensitive (nuclear power plants, military bases, etc.)?

EXAMPLE: Students evaluate the use of satellite images to collect data on human rights violations such as mass graves, deforestation in protected nature preserves, and cultivation of illegal crops, such as narcotics.

EXAMPLE: Students discuss the spatial arrangement of surveillance cameras to record activities at locations (parking lots, stores, malls, along streets, banks) in a geographical area and the uses of the information and citizen's rights (invasion of privacy, legal rights).

TECHNOLOGY USE: Remotely sensed images and digital images of Earth's surface available on the web.





Creativity and Innovation (continued)

GEOGRAPHY



4th Grade

create a graphical presentation (e.g. climograph), comparing the annual and daily variations using values such as mean, maximum, and minimum for both temperature and precipitation.

EXAMPLE: Discuss the authenticity and reliability of data from the U.S. Weather Service, such as how the information is collected, stored, and used and its accuracy. Compare and contrast the reliance on the collection of weather data remotely using ocean buoys, satellites, automatic instrument stations, and weather stations with personnel in order to get coverage of many places on Earth. Students describe that each weather station is connected to computers that process and store data.

EQUIPMENT NEEDED: Have students build their own weather-gathering instruments; rely on local remote weather reporting stations located at schools, industrial centers, and malls that are presented on websites.

SPEAKER OPPORTUNITY: Invite the local TV weather person or meteorologist to speak to the class.

FIELD TRIP OPPORTUNITY: Local weather station and/or Doppler radar center; TV weather broadcast studio.



8th Grade

OUTCOME: Possesses a fundamental understanding of the ethical/legal issues surrounding the access and use of information



EXAMPLE: Students create an address database of 3 types of economic activities in their community (service, governmental, production, processing), map those addresses with virtual globe software such as ArcGIS Explorer, analyze the resulting geographic patterns, and assess where gaps exist for a new business or service not currently available in the community (e.g.: fast food outlet; recycling center; big box store).

EXAMPLE: Develop and present a report using digital information focusing on responsible civic land use in the community, such as parks, bicycle paths, walking trails, canoe/water trails.

EXAMPLE: Apply civic questions to the land use decisions and resolve them through discussion and debate, such as: Does this land use abide by zoning laws? Does the land use change traffic patterns and have unintended consequences? Is there an environmental impact on the site and adjacent land uses?

TECHNOLOGY USES: Digital images and maps from the web.

FIELD STUDY OPPORTUNITY OR INDIVIDUAL STUDENT PROJECT: Use digital images to locate and classify economic activities and land uses. Make civic judgments regarding the proposal for land uses within a community.



12th Grade





Media Literacy

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4th Grade

- *Understanding how media messages are constructed, for what purposes and using which tools, characteristics and conventions*
- *Examining how individuals interpret messages differently, how values and points of view are included or excluded and how media can influence beliefs and behaviors*
- *Possessing a fundamental understanding of the ethical/legal issues surrounding the access and use of information*

OUTCOME: Understands how media messages are constructed, for what purposes, and uses tools, characteristics and conventions



EXAMPLE: Students use digital weather maps to explain that severe and changing daily and weekly weather patterns are important in making sound civic decisions about individual and group activities, such as sports, recreation, travel (e.g.: tornado watch, severe weather, frost advisories, travel delays, driving conditions, heat indexes, and wind advisories).

EXAMPLE: Students discuss the ways people respond to weather warnings.

EXAMPLE: Students use computer software and web pages to create an announcement that promotes the recycling of plastics and other materials in the local community, and the beneficial consequences for the local and global environment.

TECHNOLOGY USE: The Internet to review and analyze the civic importance of weather information; Computer software.



8th Grade

OUTCOME: Examines how individuals interpret messages differently and how values and points of view are included or excluded

EXAMPLE: Students read and analyze the positions on environmental issues taken by organizations and posted on the web (green groups, conservative environmental groups, property rights groups) to determine the issues on which there are major differences, where there may be some agreement, and where the issues addressed are based on different values relative to the natural environment.

EXAMPLE: Students develop a plan for implementing an environmentally-focused project in the local community such as protecting a local wetland or developing an urban greenway along a stream that uses digital mapping, data collection, land use analysis, economic development, population change, and other relevant variables.

TECHNOLOGY USE: World Wide Web.

SPEAKER OPPORTUNITY: Invite individuals representing environmental and non-environmental perspectives on the future of the local community to speak to the class.



12th Grade

OUTCOME: Understands how media messages are constructed, for what purposes, and uses tools, characteristics and conventions



EXAMPLE: Students make an inventory of the way that geography content (landscapes, globes, maps, land uses, cultural depictions, etc.) are used as company logos, web sites, backdrops, screen savers, panoramas, etc. in the digital and print media and categorize them by media and content. Assess the appropriateness of the geography content used as a backdrop relative to the expectations (criteria) that people use for getting a person's attention.

EXAMPLE: Students develop criteria and compare their preferences for logos and backdrops in advertisements with those of others in their class to discover patterns about the uses of geography to set tone and emotional context in advertising. (i.e., auto commercials often use salt flats, energy commercials often show drilling rigs, bottled water often uses mountain settings, etc.).

TECHNOLOGY USE: World Wide Web and computer software; Digital and print advertising.





Media Literacy (continued)

GEOGRAPHY



4th Grade

OUTCOME: Examines how individuals interpret messages differently and how values and points of view are included or excluded

EXAMPLE: Students read geography content based literature about a topic written by different authors and compare and contrast the perspectives on the topic.

EXAMPLE: Students compare and contrast the influences of well-illustrated books compared to books with few illustrations of geography content or the inclusion of maps to analyze the ways that different values and points of view may be presented.

EXAMPLE: Students critically analyze books by cross checking information against other sources, such as the web, to determine accuracy and fairness in the presentation of geographic information.

SUPPORTING STRUCTURE: Content based literature for elementary grades; confer with librarian.

TECHNOLOGY USE: Use websites to search titles of age appropriate books on geography.



8th Grade

OUTCOME: Possesses a fundamental understanding of the ethical/legal issues surrounding the access and use of information



EXAMPLE: Students apply Geographic information Systems (GIS) technology using specific GIS software or digital maps on the web to play the role of a geography consultant. Using ethical and legal procedures, the consultant must select the location for a new youth center (or another appropriate activity) in the local community where they must consider distance, nearby land uses, nearby businesses, traffic patterns, population distribution and density, and available sites to arrive at their final site recommendations.

EXAMPLE: Students develop a plan for implementing an environmentally-focused project in the local community such as protecting a local wetland or developing an urban greenway along a stream that uses digital mapping, data collection, land use analysis, economic development, population change, and other relevant variables.

TECHNOLOGY USE: : Examples of applications of Geographic Information Systems (GIS) and their uses.



12th Grade

OUTCOME: Examines how individuals interpret messages differently and how values and points of view are included or excluded



EXAMPLE: Students compare and contrast the ways to apply repeat photography and digital mapping to build a rationale for public and private decisions on community issues that result in long term environmental and economic advantages or disadvantages for citizens (e.g.: site and situation analysis for a public hearing to rezone land for a new use; spatial pattern of displacement of housing, businesses, streets in favor of a new land use activity).

EXAMPLE: Students select examples of repeat imaging of the landscape and analyze digital imagery (aerial photographs) showing ethical practices of landscape restoration that provide sustainable benefits to society (e.g.: benefits of investment in reducing soil erosion; sustainable use of former environmental cleanup sites; socially constructed environments and land uses; urban restoration).

WORLD WIDE WEB: Search repeat photography topics for early and present images of landscapes to provide evidence of change, improved business practices, and entrepreneurial activities.





Media Literacy (continued)

GEOGRAPHY



4th Grade



8th Grade



12th Grade

OUTCOME: Possesses a fundamental understanding of the ethical/legal issues surrounding the access and use of information



EXAMPLE: Students research the number of TV and radio programs and languages reported for a specific day or week for broadcasts within the United States by researching data from the World Wide Web (Federal Communications Commission Licensing, programming information) and map the information to present the diversity of language use globally and in the USA.
(via www.mla.org/maps)

TECHNOLOGY USE: World Wide Web:
Research language diversity in broadcast TV and radio by state using digital database development, digitally based mapping and graphing.



**4th Grade**

- *Using digital technology, communication tools and/or networks appropriately to access, manage, integrate, evaluate, and create information in order to function in a knowledge economy*
- *Using technology as a tool to research, organize, evaluate and communicate information, and understanding of the ethical/legal issues surrounding the access and use of information*

OUTCOME: Uses digital technology, communication tools and/or networks appropriately to access, manage, integrate, evaluate, and create information in order to function in a knowledge economy

EXAMPLE: Students compare and contrast aerial and ground photographs of their own community to identify and classify the changes that have occurred over time (e.g.: the size of the place in area; the land uses; types of buildings; number and locations of schools, churches, and retail stores) and prepare a digital graph or table that summarizes the changes. They then compare the changes in their own community to one other community in a different state and compare the similarities and differences.

EXAMPLE: Students conduct research and prepare a project booklet focusing on "our community and how it has changed" using digital sources and software to distribute the final product in electronic form on a website and/or in print.

TECHNOLOGY USE: Internet, historical image archives of maps, photographs, newspapers, special library collection, State library collection; community archivist, local librarian, state departments of natural resources, museums.

**8th Grade**

OUTCOME: Uses digital technology, communication tools and/or networks appropriately to access, manage, and integrate information in order to function in a knowledge economy

EXAMPLE: Students use digital population data for the United States to analyze the population distribution of the country in 1860 and 1870, copy and paste the data and organize it using a spreadsheet, rank the states from highest to lowest in population, develop quartiles (group states on population size into quarters), color code the quartiles on maps for each year, and use the maps to write a narrative describing the changes in population distribution before and after the Civil War.

TECHNOLOGY USE: Internet, archival sources of data such as the Census Bureau, <http://fisher.lib.virginia.edu/collections/stats/histcensus/>, the National Historical GIS (www.nhgis.org), and Social Explorer (www.socialexplorer.com).

OUTCOME: Uses technology as a tool to research, organize, evaluate and communicate information, and understands the ethical/legal issues surrounding the access and use of information.

EXAMPLE: Use the World Wide Web to locate health services (medical, dental, and mental health) in the local community (physicians, hospitals, immediate care clinics) and online local commercial yellow pages, so that two sources

**12th Grade**

OUTCOME: Uses digital technology, communication tools and/or networks appropriately to access information in order to function in a knowledge economy

EXAMPLE: Students use country digital databases from websites to analyze the relationships between Gross Domestic Product (GDP) and the percentage of the population engaged in agriculture for different regions of the world. The data may be categorized into quartiles and entered by category on digital maps to visualize the spatial patterns between the variables. Recommendations regarding the role of agriculture in the improvement of the GDP may be discussed and economic alternatives proposed based on the comparisons of the data. Alternatives for the improvement of GDP may be discussed further through networks of students both in the United States and in the region or country being studied. Students will reflect upon the impact of proposed changes on the social and cultural fabric of the region.

TECHNOLOGY USE: Web: Worldmapper (www.worldmapper.org), Nation Master (www.nationmaster.com), United Nations economic information data bases; <http://unstats.un.org/unsd/demographic/products/socind/inc-eco.htm> and http://www.nationmaster.com/graph/lab_emp_in_agr_of_tot_emp-labor-employment-agriculture-total.





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4th Grade



8th Grade



12th Grade



have been used to ensure the integrity of the data. Map the locations of health services using a web based digital map (or in 3D using ArcGIS Explorer or Google Earth) to display the spatial patterns of health services. Analyze the spatial pattern of health services to determine if any geographic areas or ethnic groups in the local community are underserved.

TECHNOLOGY USE: World Wide Web, Online Yellow Pages (such as www.dexknows.com); GIS software.

OUTCOME: Uses networks appropriately to access, manage, integrate, evaluate, and create information in order to function in a knowledge economy.



EXAMPLE: Students network with another school or other students in the same political jurisdiction to plan citizen awareness and action activities in support of a particular issue that will be determined in a future election, such as an educational bond election, state appropriation for education, gender equality in sports, length of the school year, and continuation of community youth programs. Use is made of the Internet, World Wide Web, cellular telephones, digital communications, and blogging to develop a systematic plan with goals, a strategy, and future steps.

TECHNOLOGY USE: Web networking, including blogging and organizing groups to support issues of importance.

OUTCOME: Uses digital technology, communication tools and/or networks appropriately to access, manage, integrate, evaluate, and create information in order to function in a knowledge economy

EXAMPLE: Students use data and maps prepared in a geographic information system to compare and analyze alternative land use proposals and communicate conclusions using tools such as advanced multimedia applications and video technologies.

EXAMPLE: Students identify and locate on digital maps the sites of webcams that provide information about patterns of interaction among people and environmental monitoring. They analyze the types of geographical information presented and construct a recording and observation plan to digitally collect and map remotely sensed information (the daily and weekly commuting patterns in a large city; the environmental changes over several months in a wildlife preserve; the observable weather patterns from geographically varied locations such as mountains, plains, and coastlines; incubation and growth of bald eagles and other species). Information observed is categorized, processed and presented in digital and image formats on class and school Web pages as posters and projects.

TECHNOLOGY USE: Web cams, digital maps, and information retrieval.





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4th Grade



8th Grade



12th Grade

OUTCOME: Uses technology as a tool to research, organize, evaluate and communicate information, and understands the ethical/legal issues surrounding the access and use of information

EXAMPLE: Students access information on the World Wide Web regarding an environmental issue that is the cause for different positions and perspectives by different groups (e.g., global climate change; energy sources; non-governmental organizations' position on issues; prominent individuals' positions on issues). The students identify the positions of each group or person and then compare and contrast the positions on the issue, considering the special interests that a particular group may represent by researching the public information available through web database sources. Declarations of intent and affiliation are a legal and ethical responsibility of groups and individuals that students evaluate.

TECHNOLOGY USE: Interpreting and judging information from the World Wide Web: validating and verifying the geographic validity of positions taken by different groups on an environmental issue.

OUTCOME: Uses technology as a tool to organize and communicate information, and demonstrates understanding of the ethical/legal issues surrounding the access and use of information

EXAMPLE: Students organize an electronic forum that includes a network of students in other communities to evaluate the humanitarian response to a natural disaster or conflict. They apply ethical standards in the collection of information regarding the geographical context of the event and the people involved and validate the digital data by cross referencing sources. Digital maps and images and on-site information accessible through electronic contacts with relief agencies and individuals are used to ascertain the practical and legal aspects for providing assistance to people affected by the event.

TECHNOLOGY USE: World Wide Web geographical data, digital news reports, scientific information regarding natural events and news releases regarding conflict; web sites for relief agencies.





Flexibility & Adaptability

GEOGRAPHY



4th Grade

- *Adapting to varied roles and responsibilities*
- *Working effectively in a climate of ambiguity and changing priorities*

OUTCOME: Adapts to varied roles and responsibilities

EXAMPLE: While preparing a group presentation about what makes the geography of their local community unique, students decide what data need to be collected, discussing the roles needed to carry out their assignment, identifying the skills needed, and discussing among themselves how to best match their talents and learning styles to the needed skill sets.

FIELD TRIP OPPORTUNITY:
Local Community.

INSTRUCTIONAL OPPORTUNITY:
Combine students of various learning styles and strengths in multiple intelligences in each group.

OUTCOME: Works effectively with changing priorities

EXAMPLE: Students use online historical and contemporary maps and aerial photographs to document how land use, transportation, and urbanization have changed over time, and what it might look like in the future. They will examine how the priorities of what one group wants the future of the community to be might be different from the priorities of another group (i.e. one group might want the community to remain rural, while another group might want the community to become a bedroom community for an adjacent metropolitan area).



8th Grade

OUTCOME: Works effectively in a climate of ambiguity

EXAMPLE: When comparing demographics of U.S. cities and states, students gather and critically analyze information from a variety of sources and understand (and “tolerate”) how and why data may not be consistent, e.g., from two different sources, the population of Los Angeles may vary from 3.5 million (within city limits) to nearly 10 million (metro area).



12th Grade

OUTCOME: Works effectively in a climate of ambiguity

EXAMPLE: Students use blogs to engage in dialogue about an issue of importance to them, such as sustainability efforts at a local university campus, health problems in their local community (such as asthma or diabetes), or immigration policies in their state, demonstrating understanding, tolerance, and respect for the points of view of others.

TECHNOLOGY USE: Online bulletin boards.





Flexibility & Adaptability (continued)

GEOGRAPHY



4th Grade

TECHNOLOGY USE: Investigating online maps hosted by historical societies, local governments, university map libraries, and commercial sources (such as <http://historical.maptech.com>).



8th Grade



12th Grade





Initiative & Self-Direction

GEOGRAPHY



4th Grade

- *Monitoring one's own understanding and learning needs*
- *Going beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise*
- *Demonstrating initiative to advance skill levels towards a professional level*
- *Defining, prioritizing and completing tasks without direct oversight*
- *Utilizing time efficient efficiently and managing workload*
- *Demonstrating commitment to learning as a lifelong process*

OUTCOME: Monitors one's own understanding and learning needs

EXAMPLE: As a result of a mapping skills unit, students create an age-appropriate electronic portfolio of maps that describe their local community, and write a reflective essay explaining how selected portfolio pieces indicate what they have learned about specific topics related to their community's history, landforms, climate, people, government, and vegetation, and also the topics that they would like to learn more about in the coming years.

OUTCOME: Explores and expands one's own learning and opportunities to gain expertise

EXAMPLE: After examining online weather reports and satellite imagery, students use latitude and longitude data to track the movement of common weather fronts over a week's time period across the continental USA, and use ArcExplorer or other GIS (Geographic Information System) to map the latitude-longitude data that they have gathered.



8th Grade

OUTCOME: Monitors one's own understanding and learning needs

EXAMPLE: As a result of studying a historic event, students create an age-appropriate electronic portfolio of historic maps and other geographic perspectives related to the historic event and write a reflective essay explaining how selected portfolio pieces describe how what they have learned historically is related to the geography of the region. The essay needs to include a reflection on the new skills and knowledge the student acquired in the process, the additional skills and knowledge they would like to explore further, and the resources that they might use to acquire those skills.

TECHNOLOGY USE: Electronic portfolio.

OUTCOME: Demonstrates initiative to advance skill levels towards a professional level

EXAMPLE: Students use time sequence of remotely-sensed satellite images to identify changes in the forests of Colorado over time, identifying areas infested with pine beetles. They should interview one U.S. Forest Ranger using remote Internet and a computer camera to survey the forests that they identify as most severely impacted, discovering what skills and resources the forest rangers gain and use to help mitigate these invasive beetles.

PROFESSIONAL DEVELOPMENT FOR TEACHERS: How to access and read remotely-sensed images.



12th Grade

OUTCOME: Monitors one's own understanding and learning needs

EXAMPLE: Using a GIS (Geographic Information System), students prepare maps using different classification methods of a single phenomenon (such as the percent of school-age population by county in the USA, or the percent of agricultural land by county in the USA), including equal area, natural breaks, standard deviation, quantile, and manual. In conjunction with readings from the book *How To Lie With Maps*, reflect how different classification methods affect how that phenomenon is understood. Reflect on how the data as shown by the histogram affects how those data are shown on maps. Reflect further how maps are powerful phenomena that can purposely or inadvertently mislead or inform different audiences. Reflect on the skills and knowledge they have gained in creating these different maps, and what areas they see as important to how they will critically examine maps in the future, especially post high school.

TECHNOLOGY USE: Electronic portfolio.





Initiative & Self-Direction (continued)

GEOGRAPHY



4th Grade

OUTCOME: Utilizes time efficiently and manages workload

EXAMPLE: On a weekly basis, students draw a map of the USA, gradually constructing a map portfolio, including one new layer each week, with the goal that the final portfolio of maps include the following items; landforms, climate, vegetation, population, ethnicity, agriculture, and median age. These 7 layers need to be planned and constructed as the units are introduced and turned in at the end of each 2 week period during the semester.



8th Grade

OUTCOME: Demonstrates commitment to learning as a lifelong process

EXAMPLE: Students examine the magnitude of the stars each evening for two weeks, (1) assessing the amount of light pollution in their community, (2) comparing their community to the amount of light pollution in other communities using the Globe at Night project, and (3) comparing the magnitude as affected by the phases of the moon. They make predictions as to how the community's light pollution compares to other communities and how the magnitude will be affected by the last two weeks of the lunar phase cycle.

TECHNOLOGY USE: Online resources.

OUTCOME: Utilizes time efficiently and manages workload

EXAMPLE: On a quarterly basis, students examine phonological (cyclical seasonal patterns) data and remotely sensed imagery of the advance and contraction of the "greenness index", which shows the greening up of deciduous vegetation across North America as the seasons change. They predict and assess why and how the seasons affect the changes in vegetation, and why the vegetation does not change uniformly with latitude across the USA. Rather, vegetation is affected by precipitation, the ecoregion, and the elevation. They must plan their work so that they can conduct this assessment on a quarterly basis as close to the equinoxes and solstices as possible.



12th Grade

OUTCOME: Demonstrates initiative to advance skill levels towards a professional level

EXAMPLE: Students interview local health officials, and/or interact with experts at a distance to understand how health agencies collect appropriate data. Students then access publicly available data in map and tabular form from the Center for Disease Control, use a GIS (Geographic Information System) to monitor the spread of disease within a region, and reflect upon (1) how maps are similar and different from tables, and (2) how CDC officials use data in map and tabular form.



TECHNOLOGY USE: GIS.

OUTCOME: Defines, prioritizes, and completes tasks without direct oversight

EXAMPLE: To test the law of retail gravitation (i.e., the number of visits a resident makes to competing shopping centers is inversely proportional to the distances between residence and center and proportional to the size of the center), students work in small groups to conduct a community survey of a retail area's "retail gravity" on a non-school attendance day. Students develop a project plan, assign roles and timelines, and develop a rubric for their work with minimal guidance from their teacher.





Social & Cross-Cultural Skills

GEOGRAPHY



4th Grade

- Working appropriately and productively with others
- Leveraging the collective intelligence of groups when appropriate
- Bridging cultural differences and using differing perspectives to increase innovation and the quality of work

OUTCOME: Works appropriately and productively with others

EXAMPLE: Students divide themselves into teams to prepare a class news report exploring a key economic issue facing a particular world region, such as regulating the lion population while trying to raise cattle in Kenya. Students determine who will do which type of research, who will do the presenting, who will film the presentation, who will show the final presentation video to the class, and how they will collect feedback from the rest of the class via a class survey.

Based on an actual issue, as reported on Sixty Minutes (March 29, 2009).

OUTCOME: Leverages the collective intelligence of groups when appropriate

EXAMPLE: Students in the class role-play citizens in a town meeting where members of the community express different points of view about a local issue, such as the location of a new school, building a bypass for traffic, or a re-zoning of downtown to be “pedestrian only” without vehicles, etc. They decide which roles are needed, who will play each role, what information is required to understand the viewpoint of each role, and how that role will be presented to the rest of the class.



8th Grade

OUTCOME: Works appropriately and productively with others

EXAMPLE: Students work on a team to investigate the major types of natural hazards present in their community. Using a GIS (Geographic Information System) and selecting one of these hazards, they prepare appropriate maps and a community response plan in the event of a natural disaster in the chosen hazard. After presenting their findings to the class and hearing the hazards chosen by the other groups, they discuss how their hazard response plan is similar to and different from those plans developed with other hazards as their main focus. They consider the types of hazards present in other communities in other parts of the USA and in other parts of the world.

TECHNOLOGY USE: GIS.

OUTCOME: Bridges cultural differences and uses differing perspectives to increase innovation and the quality of work

EXAMPLE: Students write a dialogue between different people who use water resources in a region, including a farmer/rancher, a manufacturer, a parent concerned about pesticide runoff, and an owner of 20 car washes in the region. Students reflect on the common concerns of these 4 groups, and the differences between these 4 groups of people. What common themes could bring these groups together to form a community water board?



12th Grade

OUTCOME: Works appropriately and productively with others

EXAMPLE: Students work on a team to prepare a multimedia presentation on one toxic and hazardous material, discussing how it affects the local community, how it affects the global community, why it is created and used, and how it is handled, moved, processed, and stored at a local and a global scale. The materials could be those used in dry cleaning, in gas stations, in power plants, in university biology labs, and in other common settings. They will use OSHA's resources to determine the chemical's toxicity. They will prepare their report for the EPA and present it to their peers in class. Their peers in class act as EPA representatives, and prepare questions that the presenter must answer about their chosen material.

TECHNOLOGY USE: Multimedia presentation.

OUTCOME: Bridges cultural differences and uses differing perspectives to increase innovation and the quality of work

EXAMPLE: Students create a website with guidelines and information for humanitarian aid workers to assist them with the transition to living in one chosen different culture other than the USA.

TECHNOLOGY USE: Internet, Digital libraries.





Social & Cross-Cultural Skills (continued)

GEOGRAPHY



4th Grade

OUTCOME: Bridges cultural differences

EXAMPLE: As students study countries around the world, they list the predominant language spoken; at the end of the school year, students tabulate and map major languages. Students discuss how physical and cultural geography (including electronic communication) has shaped the origin and spread of language groups of the world, and what the world language map might look like 100 years from the present.



GUEST SPEAKER OPPORTUNITY:

Invite speakers of other languages to speak about the language and culture of their country, helping students learn numbers (or colors, months, names of countries, etc.) in the guest speaker's language.

ENGLISH AS SECOND LANGUAGE STUDENTS: Have students share their native language and discuss what it is like to be bilingual.



8th Grade

OUTCOME: Bridges cultural differences and uses differing perspectives to increase innovation and the quality of work

EXAMPLE: Students conduct research on a native culture of North America, and one of South America, investigating why motifs, artwork, and materials were similar and were different, and how the artwork represented the culture. They create a multimedia report showing their findings and present these findings to their class. They work in the school's art classroom to create one object (sculpture, painting, wood carving, etc) that reflects one of their two chosen cultures.

FIELD TRIP OPPORTUNITY: Visit an art or anthropological museum to see authentic artistic representations of past cultures.



12th Grade





Productivity & Accountability

GEOGRAPHY

- *Setting and meeting high standards and goals for delivering quality work on time*
- *Demonstrating diligence and a positive work ethic (e.g., being punctual and reliable)*



4th Grade

OUTCOME: Sets and meets high standards and goals for delivering quality work on time

EXAMPLE: Students develop and execute a plan to gather data about the height, girth, species, and health of all trees in a specified geographic area—on their school campus, or in a local park. First, they conduct research as to the aesthetic, environmental, and property value of urban trees, and how communities use and value tree inventories. They then use GPS hand held receivers in small groups to record the location of the trees and create a spreadsheet with the tree data that they will map using a GIS (Geographic Information System). They will assess the pattern that they see as a result of mapping their data, and create a tree management plan for their campus or park to ensure that tree cover will increase in the future. They will share this database with school groundskeepers, community foresters, and other municipal managers at a scheduled board meeting.

TECHNOLOGY USE: GPS, GIS.



8th Grade

OUTCOME: Sets and meets high standards and goals for delivering quality work on time

EXAMPLE: Students actively participate in international investigation projects, such as GLOBE, in which student participants are held responsible for the quality of the data they submit. The data could range from pH of soil on their school grounds to daily readings of temperature and precipitation over a month's time period.

TECHNOLOGY USE: Internet.

OUTCOME: Demonstrates diligence and a positive work ethic

EXAMPLE: Students initiate and carry out a long-term community-mapping project whereby students, in collaboration with a community partner, use spatial locations instruments such as GPS units, schedule meetings, and manage timelines and deliverables to create a product for use in the community. The community partner could be a librarian, city planning official, or community board member. The product created could be an assessment of the city's attempts to develop greenways along its major rivers, the city's attempts to create bikeways along specific thoroughfares, or the city's attempts to plant low-water plants at its public building grounds.

TECHNOLOGY USE: GPS, GIS.



12th Grade

OUTCOME: Sets and meets high standards and goals for delivering quality work on time

EXAMPLE: Students create a high-quality set of digital maps, including data that the students have gathered in the local community, to submit to an agency outside the classroom, e.g., for a national contest (such as the ESRI Community Mapping program), the local newspaper, or for a community member's presentation to the city council. The topic could be the conversion of abandoned big box stores to community uses, the creation of a bike trail along an abandoned railway line, or another project aligned with the themes of geography such as movement or human-environment interaction.

TECHNOLOGY USE: Digital Map.

EXAMPLE: Students gather, map, and analyze data from police records, e.g., crime, accident, or graffiti, and overlay other variables to detect and interpret any spatial and temporal patterns, and share results with the community at a local meeting. Students must geocode the addresses of the police records to the correct location, and reflect on the quality and completeness of the data received from the police department. They make recommendations as to how the crime or accident analyzed could be mitigated, and how the geographic perspective aids in understanding the phenomenon.





Productivity & Accountability (continued)

GEOGRAPHY



4th Grade

OUTCOME: Demonstrates diligence and a positive work ethic

EXAMPLE: Students read a series of fiction books/short stories about other cultures according to an assigned schedule. They then discuss their impressions and conclusions via email/Facebook/Skype with students in other cities and countries about the same reading. They develop chat rooms and networks and make commitments to other students in other locations to analyze the presentation of other groups within literature.

TECHNOLOGY USE: Email, Facebook, Skype.



8th Grade



12th Grade





Leadership & Responsibility

GEOGRAPHY



4th Grade

- *Using interpersonal and problem-solving skills to influence and guide others toward a goal*
- *Leveraging strengths of others to accomplish a common goal*
- *Demonstrating integrity and ethical behavior*
- *Acting responsibly with the interests of the larger community in mind*

OUTCOME: Leverages strengths of others to accomplish a common goal



EXAMPLE: After gathering data from reliable Internet and traditional sources to describe and assess the impact of litter in the community, students design and implement a community service project, (e.g., brochure, posters, etc.), to raise awareness of this issue. They also reflect on the accuracy of the data sources that they analyzed.

OUTCOME: Demonstrates integrity and ethical behavior



EXAMPLE: While studying countries around the world, students establish ongoing communication with students from other countries (via letters, email, or electronic bulletin boards) to learn about how cultures are the same and different, (e.g., language, clothing, music, activities, etc.). They will begin the communication with generative questions such as “Where do your clothes come from? Where does your food come from? What activities do you engage in after school?”, etc. They write reports to summarize their findings and discuss the similarities and differences.

TECHNOLOGY USE: Email, Electronic bulletin board.



8th Grade

OUTCOME: Demonstrates integrity and ethical behavior



EXAMPLE: After reading fiction and non-fiction novels about contemporary young refugees in various situations around the world, students participate in simulation or role-playing activities in which they grapple with the ethics of complex issues, such as the refugee crisis in Sudan or elsewhere.



12th Grade

OUTCOME: Uses interpersonal and problem-solving skills to influence and guide others toward a goal



EXAMPLE: Working in groups, students develop a strategy to substitute alternative sustainable activities for present economic activities in regions of significant resource depletion, e.g., fisheries off of the Grand Banks of Canada, logging in the Pacific Northwest, or extensive irrigation practices in desert climates of Uzbekistan or Arizona. They share their results with local officials or with local media.

OUTCOME: Demonstrates integrity and ethical behavior

EXAMPLE: While studying contemporary political and economic alliances, students explain how these affect the traditional cohesiveness of world cultures and discuss ethical issues associated with the loss of diverse cultures. They apply what they have learned globally to conduct an in-depth study of how one culture is grappling with globalization, and they demonstrate their understanding with a multimedia presentation (using Windows Movie Maker or iMovie) of the implications that this has for other cultures.





Leadership & Responsibility (continued)

GEOGRAPHY



4th Grade

OUTCOME: Acts responsibly with the interests of the larger community in mind



EXAMPLE: Students propose and discuss specific actions that can help alleviate an environmental problem or relevant community issue and the likely consequences of such actions, e.g., recycling, biking to school, reducing consumption, buying local products, etc. They conduct research as to how a citizen proposal to the city council needs to be formatted, and use that format to create their recommendations. They record a video of themselves making their recommendations to the council, and send the video to the council before the council's next meeting.



8th Grade



12th Grade





Creativity & Innovation

GEOGRAPHY



4th Grade

- *Demonstrating originality and inventiveness in work*
- *Developing, implementing, and communicating new ideas to others*
- *Being open and responsive to new and diverse perspectives*
- *Acting on creative ideas to make a tangible and useful contribution to the domain in which the innovation occurs*

OUTCOME: Demonstrate originality and inventiveness in work



EXAMPLE: After studying ecosystems, endangered species, and specific needs of different animal species (climate, food, location), students design a zoo habitat for a polar bear (or other species) exhibit that ensures the animal's needs.

FIELD TRIP OPPORTUNITY:
Visit a local zoo.

EXAMPLE: While visiting a local zoo, students evaluate the appropriateness of the zoo habitat for the species studied.

EXAMPLE: After reading 4th grade appropriate literature, students create a map of the location(s) featured in the literature and present their map to the class.

OUTCOME: Develop and communicate new ideas to others



EXAMPLE: Use aerial photos to identify the locations and patterns of economic activities in their community (factories, stores, office buildings, housing developments, malls, interstates, hospitals, farms, etc. Students work in groups to create a poster, multimedia presentation, or website showing possible locations for economic growth in the future,



8th Grade

OUTCOME: Demonstrate originality and inventiveness in work

EXAMPLE: Study the different types of regions (formal, functional, perceptual). Have students, working in groups, select a professional team and do research on the region of fans that support the specific team. Students can generate ideas of what criteria might help to define the functional region of a fan support area around that team, create a map depicting the fan region, and hypothesize how the delineated "fan region" influences the sale of team items, ticket sales, marketing, player appearances, etc.

SUPPORTING STRUCTURE: A functional region is a region defined by a node and a set of activities or interactions which occur within the region. A functional region of a sports team would be defined by the area surrounding the node (home city of team or in cities with more than one professional team, the actual stadium site) from which a significant number of fans reside.

OUTCOME: Develop and communicate new ideas to others

EXAMPLE: Students create population maps of their home area (by census tract) using the U.S. Census Factfinder web mapping service. Students can select from various data sets (median age of population, population density, etc.) in order to determine population change in their home community over several decades. Students develop



12th Grade

OUTCOME: Demonstrate originality and inventiveness in work

EXAMPLE: In groups, students research different cities making bids to host the upcoming Olympics (or use a set of teacher-selected world cities). Using available maps and data on the internet, students make the case for why their city should be chosen to host the next Olympics. These arguments should include a presentation about needed venues, language requirements of visitors, and transportation needs. A class simulation might also include a International Olympic Committee panel of students or teachers which would "judge" and decide which group made the most convincing case.

EXAMPLE: Students could compare their research and presentation with a recent U.S. or world city which hosted the Olympics.

TECHNOLOGY USE: Google Earth, ArcExplorer Java Edition (ESRI)-free GIS software for schools, Terra Server, GIS.

OUTCOME: Develop and communicate new ideas to others

EXAMPLE: Students prepare a panel discussion focusing on use of renewable and non-renewable energy resources. The panel presentation should express various points of view about energy resources (from local biofuels, wind energy plants, to global resources). Students could present the panel discussion at the public library for the general public or at a special school event.





Creativity & Innovation (continued)

GEOGRAPHY



4th Grade

such as where a new movie theater might be built, where a new skate park might be located, or where a new school may be needed.

RELEVANT RESOURCES: TerraServer is an online provider of high resolution air photos, satellite images, and USGS topographic maps. Downloads are free. Individuals can locate their community, zoom to images, and identify different features on the high resolution air photos.

LEARNING ENVIRONMENTS:
Local community.

OUTCOME: Be responsive to new and diverse perspectives

EXAMPLE: After reading and discussing a book with various perspectives of Earth, such as *Zoom* by Istvan Banyai, *Looking Down* by Steve Jenkins, or *My Map Book* by Sara Fanelli, and learning how scale impacts what we see and can learn about a particular place, students create their own map book, showing their state, city, neighborhood, house, and a favorite room in the house.

RELEVANT RESOURCES: Any maps of state and local region.

TECHNOLOGY USE: Google Earth, ArcExplorer Java Edition (ESRI)-free GIS software for schools, Terra Server.



8th Grade

a summary of change in their community over several decades and create a report for their local school board, county commissioners, or local newspaper in which the students communicate how these population changes may affect the needs of their community.

TECHNOLOGY USE:
<http://factfinder.census.gov/>

LEARNING ENVIRONMENTS:
Local community.

OUTCOME: Respond to new and diverse perspectives

EXAMPLE: Students use the Internet to locate and download regional and global data about teenage purchase of recorded music, comparing local download statistics to those of at least one other region or country. Students are encouraged to investigate the validity of the data they find, and note any biases in the presentation of the data. Working in teams, students prepare graphs comparing these data sets for a multimedia presentation to the class.

EXAMPLE: Students listen to a popular music download from another region and write a journal entry comparing and contrasting that popular music to their own favorites. These journal entries may be posted to a class website, shared with other classes, or within their own class.

TECHNOLOGY USE: Internet.



12th Grade

OUTCOME: Respond to new and diverse perspectives

EXAMPLE: To assess people's attitudes, perceptions, and responses toward a natural hazard in the local community (i.e., flooding, tornado, hurricane, earthquake), students design questions and conduct interviews with local experts, community leaders, and residents. With the findings that emerge (previous experience, socioeconomic status, distance from an actual event, etc.), students create a poster, multimedia presentation, website, brochure or wiki to explain the varied responses of interviewees.

LEARNING ENVIRONMENTS:
Local community.

OUTCOME: Act on a creative idea and make a useful contribution

EXAMPLE: Students use a GIS (Geographic Information System) to analyze information on soil, hydrology, and other factors in order to choose the best site for a sanitary landfill in an urban region, and prepare an informational video to present findings.

TECHNOLOGY USE: GPS, GIS, Google Earth.





Creativity & Innovation (continued)

GEOGRAPHY



4th Grade

OUTCOME: Act on a creative idea and make a useful contribution

EXAMPLE: After studying the home cultures of immigrants in their community, students brainstorm ways to make new immigrants feel welcome to their community. Additionally, students research common questions of new immigrants in their community and create welcome brochures to be distributed at grocery stores, schools, churches as well as other appropriate locations to serve as a bridge for new immigrants to their new culture.



8th Grade

OUTCOME: Act on a creative idea and make a useful contribution

EXAMPLE: Using a GPS (or download a Google Map image to ArcExplore Java Edition AEJEE), students create a map of the different types of vegetation on the school property (or in a local park). Students research to identify species, noting the health of plants, and determine whether plants are native species. Students use these findings to prepare recommendations to the School Board (or Park authorities) about diversifying plant species, developing a native species trail/garden, or creating a local arboretum to use in science classes.

TECHNOLOGY USE: ArcExplorer Java Edition (ESRI)-free GIS software for schools, GPS.



12th Grade





Critical Thinking & Problem Solving

GEOGRAPHY



4th Grade

- *Exercising sound reasoning in understanding*
- *Making complex choices and decisions*
- *Understanding the interconnections among systems*
- *Identifying and asking significant questions that clarify various points of view and lead to better solutions*
- *Framing, analyzing and synthesizing information in order to solve problems and answer questions*

OUTCOME: Exercises sound reasoning in understanding

EXAMPLE: Organize student groups to represent various local interest groups such as retailers, little league teams, farmers/local gardeners, or realtors. Each group collects data about the weather on a daily and seasonal basis from newspapers, the Internet, and TV. Groups present their finding to each other and create a multi-faceted portrait of how climate affects their community.

OUTCOME: Understands the interconnections among systems

EXAMPLE: Students use an internet resource for calculating their own and their family's carbon footprint (example; <http://www.nature.org/initiatives/climatechange/calculator/>). Students then compile their results for the collective carbon footprint of their class. Students work in groups to determine different methods for reducing their carbon footprint. Results could be presented in wiki format and shared with other classes or as a poster in the school lobby, or as a news item in the school newsletter.



8th Grade

OUTCOME: Exercises sound reasoning in understanding

EXAMPLE: Students are assigned to groups to research information about a specific state park in their state (different amenities at each park, campsites available, recreation opportunities, etc.) along with data about population in the state. Groups develop a case study to advocate for additional amenities at their specific state park using documentation such as maps, examples from other parks in other states, etc.

TECHNOLOGY USE: GIS.

OUTCOME: Makes complex choices and decisions

EXAMPLE: Students develop plans to improve environmental quality in their community. Groups propose different alternatives such as: new recycling centers, adopt a road/highway projects, developing green spaces, planting trees, etc. As a class, students discuss the costs/benefits of the different alternatives and decide which plan is "best" for improving environmental quality in their community.



12th Grade

OUTCOME: Exercises sound reasoning in understanding

EXAMPLE: Using the Internet and digital libraries, students identify alternative sustainable economic activities in regions of significant resource depletion. These investigations could examine depletion of forested regions in Africa or South Asia due to the heavy use of wood for heating and cooking, declining water resources in the western U.S. and Great Plains, water resources around the Aral Sea, or coal in regions in Appalachia in the U.S.

TECHNOLOGY USE: Internet.

OUTCOME: Understands the interconnections among systems

EXAMPLE: Students examine the interconnections between locations in the world by investigating the commodity chain of one product they frequently use. A student might investigate the different parts that go into making a baseball, their favorite candy bar, a designer purse, or even their sneakers. Most of this information can be researched on the Internet. Students create a map of the world documenting the locations of the different components of their product and how those components come together to form a commodity chain.

TECHNOLOGY USE: GIS.





GEOGRAPHY

Critical Thinking & Problem Solving (continued)

**4th Grade**

OUTCOME: Identifies and asks significant questions that clarify various points of view and lead to better solutions.



EXAMPLE: Students begin by analyzing world population density maps from different periods in history. Prompt student questions about these different patterns and what population density means and how they might feel it personally. (Density can be quickly replicated in the classroom space using number of students per square foot so that students are able to visualize the importance of density). Students can then use current growth rates to calculate population change for specifically identified countries (or regions) in the world. Using these data, students can hypothesize what influences these population change numbers might cause in the different countries or regions.

OUTCOME: Frames, analyzes and synthesizes information in order to solve problems and answer questions

EXAMPLE: Students use data on agricultural production by state, population density maps, climate maps and data on land acreage in cropland to describe relationships between population, climate, and agricultural production in the U.S. Students, in groups, could research one major U.S. agricultural product and make connections to their own lives and typical foods that they consume.

**8th Grade**

OUTCOME: Understands the interconnections among systems

EXAMPLE: Using digital libraries for data, students research the delivery of primary education in various world cities; small groups can research one city. (The teacher should select cities in more developed regions, developing regions, and in countries with various types of political/economic systems.) Students share their findings and examine the relationships between development, type of political system, influence of religion, etc. on the delivery of primary level education in different parts of the world.

TECHNOLOGY USE: Internet, Digital Spreadsheet.

OUTCOME: Identifies and asks significant questions that clarify various points of view and lead to better solutions

EXAMPLE: Students identify historic and contemporary migrant groups in their area, and brainstorm questions they would ask to determine why migration occurs and what patterns it takes, based on various scenarios (war, famine, etc.). Students form teams to investigate changes that occur as people migrate to a new region (change to both the migrating group and to the region to which they migrate), then present their findings to the class.

**12th Grade**

OUTCOME: Identifies and asks significant questions that clarify various points of view and lead to better solutions

EXAMPLE: To explore and analyze environmental land use changes in a given region, students compare maps, aerial photographs and remotely-sensed images from different historic periods. Students use internet resources from TerraServer, USGS, and the Cartographic Division of the Library of Congress, to compare land use in a particular community or state over time. Students develop questions that should have been asked before the changes in environmental land use occurred and then seek answers to those questions post-development. For example: students could examine the area around Orlando, Florida before 1960 and in 2000 to determine the land use changes which have occurred due to population growth, recreational land development, etc. Students create a “before” and “after” documentary, depicting the costs and the benefits of the land use change they examined.

TECHNOLOGY USE: Remote Sensing.





Critical Thinking & Problem Solving (continued)

GEOGRAPHY



4th Grade



8th Grade



12th Grade

OUTCOME: Frames, analyzes and synthesizes information in order to solve problems and answer questions

EXAMPLE: Using a GIS, students create maps to determine the best location for a new retail or service shop in their community (i.e. a new bicycle shop, bookstore, coffee shop). Before beginning the GIS, students should develop criteria (for the layers of data of the GIS) that will support the new location.

TECHNOLOGY USE: GIS.

OUTCOME: Frames, analyzes and synthesizes information in order to solve problems and answer questions

EXAMPLE: Students use remotely sensed images along with thematic maps to determine the consequences of building homes in environmentally hazardous areas, such as in flood plains or along faults. An excellent case study would be New Orleans. Students create editorial cartoons depicting various solutions to development in environmentally hazardous areas.

TECHNOLOGY USE: Remote Sensing.





Communication & Collaboration

GEOGRAPHY



4th Grade

- *Articulating thoughts and ideas clearly and effectively through speaking and writing*
- *Demonstrating the ability to work effectively with diverse teams*
- *Exercising flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal*
- *Assuming shared responsibility for collaborative work*

OUTCOME: Articulates thoughts and ideas clearly and effectively through speaking and writing

EXAMPLE: After studying the history of a Native American group, students present an oral report accompanied by maps and drawings and information about how geography affected the group (climate related to shelters and food options, landscape/environment related to alliances and protection, etc.).

FIELD TRIP OPPORTUNITY: Visit a museum with Native American exhibitions and/or consult web resources on Native Americans (Smithsonian, e.g.).

OUTCOME: Exercises flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

EXAMPLE: Using the Internet and other resources, students develop a class wiki to compare the daily life of a student in another culture/country with their own. Students focus their wiki on depicting the geography (physical and cultural), using pictures, diagrams, maps.

TECHNOLOGY USE: Internet.



8th Grade

OUTCOME: Articulates thoughts and ideas clearly and effectively through speaking and writing

EXAMPLE: Student groups, adopting various perspectives, research a recent world/local event (hurricane, volcanic eruption, flood, war, famine, mass migration, earthquake, etc.). These various perspectives could be as an environmentalist, a politician, a relief worker from the U.N., a local journalist, etc. Students create a slideshow of the event from their unique perspective to the rest of the class. Students journal at the conclusion to synthesize how various perspectives can influence understanding of an event.

TECHNOLOGY USE: Internet.

OUTCOME: Demonstrates ability to work effectively with diverse teams.

EXAMPLE: After studying an environmental community issue (landfills, water quality, maintaining open space, recycling), students compose e-mail messages appropriate to various local, state, and national officials, stating their opinion and offering alternatives to current methods of dealing with the issue. Encourage students to consider their audience and develop effective ways to create a coordinated and articulate email campaign that will have an impact.

TECHNOLOGY USE: Email.



12th Grade

OUTCOME: Articulates thoughts and ideas clearly and effectively through speaking and writing

EXAMPLE: After choosing and investigating a local environmental land use proposal (new strip mall, construction of a new road/bridge), students write an editorial to their local paper in favor of or opposing the proposal, citing relevant geographic data.

OUTCOME: Exercises flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

EXAMPLE: After a panel simulation of participants who represent different points of view about sustainable development regarding the harvesting of rain forests, students create a compromise between the need for protection of the environment, the demand for rainforest land and products by both local and global consumers.





Communication & Collaboration (continued)

GEOGRAPHY



4th Grade

OUTCOME: Assumes shared responsibility for collaborative work

EXAMPLE: After a field study trip of their community, students work in small groups to create a simple slideshow and taped narrative that describe their favorite locations in the community. Locations should also be depicted as features on a map.

FIELD TRIP OPPORTUNITY:
Local Community.



8th Grade

OUTCOME: Assumes shared responsibility for collaborative work

EXAMPLE: Students investigate the lives of immigrants via historical accounts, museum visits, and other research. They then work as a team to write and produce a play about immigrants to a new country struggling to deal with the issues involved in adapting to a new environment.

EXAMPLE: Students investigate the lives of immigrants to their local area over history using various internet and local resources. Students work as a team to write a collective history about how immigrants shaped their local landscape.



12th Grade

OUTCOME: Assumes shared responsibility for collaborative work

EXAMPLE: Working with the local park district, students create a plan for mapping and upgrading open space for multiple uses (e.g., family picnicking, community events/celebrations, habitat for plant and animal species, etc.) Students create multimedia presentations to support their recommendations and present them to the relevant local government agency. Public hearings, a web based survey of the plan, and a community dialogue using the web provides the opportunity to engage citizens in civic action.

